CLAIMS

1. A method for reconstructing complex wave attributes described by an object function O from limited view measurements u of a measurement surface $\mathbf{r}$ with associated wavevector $\mathbf{K}$, said method comprising the steps of:

processing said limited view measurements u to obtain Fourier transformed measurements $\tilde{u}$;

determining a Fourier transformed object function $\tilde{O}$ of said object function O;

determining an analytic relationship between said Fourier transformed object function $\tilde{O}$ and said Fourier transformed measurements $\tilde{u}$;

analytically extending said Fourier transform $\tilde{O}$ by specifying that $\tilde{O}(\mathbf{K}) = \tilde{O}(-\mathrm{K})$, thereby obtaining an analytically extended Fourier transform of $\tilde{O}$; and,

reconstructing said complex wave attributes by inverting said analytically extended Fourier transform of $\tilde{O}$.

2. The method of Claim 1 wherein said complex wave attributes are wave speed and attenuation.

3. The method of Claim 1 wherein said complex wave attributes are dielectric and electrical conductivity.

4. The method of Claim 1 wherein said complex wave attributes are acoustic wave speed density and compressibility.

5. The method of Claim 1 wherein said object function is one-dimensional.

6. The method of Claim 1 wherein said object function is two-dimensional.

7. The method of Claim 1 wherein said object function is three-dimensional.

8. The method of Claim 1 wherein said measurement surface **r** comprises a ring.

9. The method of Claim 1 wherein said measurement surface **r** comprises a sphere.

10. The method of Claim 1 wherein said measurement surface **r** comprises a cylinder.

11. The method of Claim 1 wherein said measurement surface **r** comprises a plurality of parallel lines.

12. The method of Claim 1 wherein said measurement surface **r** comprises a plurality of perpendicular lines.

13. The method of Claim 1 wherein said measurement surface **r** comprises a line and a curved surface.

14. The method of Claim 1 wherein said limited view measurements are time domain measurements.

15. The method of Claim 1 wherein said limited view measurements are frequency domain measurements.

16. A method for reconstructing complex wave attributes described by an object function O from limited view measurements u of an object with associated wavevector **K**, said method comprising the steps of:

processing said measurements u to obtain Fourier transformed measurements $\tilde{u}$;

determining a midpoint of said object;

creating shifted Fourier transformed measurements $\tilde{u}_R$ by shifting said Fourier transformed measurements $\tilde{u}$ so that said midpoint is located at the origin;

determining an analytic relationship between said object function O and said shifted Fourier transformed measurements $\tilde{u}_R$;

determining the Fourier transform $\tilde{O}$ of said object function O from said Fourier transformed measurements $\tilde{u}_R$ using said analytic relationship;

analytically extending said Fourier transform $\tilde{O}$ by specifying that $\tilde{O}(\mathrm{K}) = \tilde{O}(-\mathrm{K})$, thereby obtaining an analytically extended Fourier transform of $\tilde{O}$;

determining shifted complex wave attributes by inverting said analytically extended Fourier transform of $\tilde{O}$; and,

reconstructing said complex wave attributes by shifting said shifted complex wave attributes back to said midpoint.

17. The method of Claim 16 wherein said step of determining a midpoint comprises the steps of:

determining the complex contrast of said object;

determining the magnitude of said complex contrast; and,

choosing said midpoint to be the center location of said complex contrast.

18. The method of Claim 16 wherein said step of determining a midpoint comprises the steps of:

determining the complex contrast of said object;

determining the magnitude of said complex contrast; and,

choosing said midpoint to be the mid-depth of said complex contrast.

19. The method of Claim 16 wherein said midpoint is a spatial component and said step of determining a midpoint comprises choosing said midpoint to be the depth achieved at the maximum measured travel time.

20. The method of Claim 16 wherein said midpoint is a temporal component and said step of determining a midpoint comprises choosing said midpoint to be the maximum measured travel time.